THAT WHICH IS CLAIMED:

1.(New) A computer system for controlling a nonlinear physical process, the computer system comprising:

a linear controller connected to receive a command signal for control of the nonlinear physical process and an output signal from the output of the nonlinear physical process, the linear controller generating a control signal based on the command signal, the output signal, and a fixed linear model for the process; and

a neural network connected to receive the control signal from the linear controller and the output signal from the nonlinear physical process, the neural network receiving the control signal as an input and using the output signal to modify the connection weights of the neural network, the neural network generating a modified control signal supplied to the linear controller to iterate or approximate a fixed point solution used to control the nonlinear physical process to correct for errors inherent in modeling the physical process using the fixed linear model.

2. (New) A computer system as claimed in Claim 1 wherein the linear controller is a proportional-derivative (PD) controller.

3. (New) A computer system as claimed in Claim 1 wherein the linear controller is a proportional-integral-derivative (PID) controller.

4. (New) A computer system as claimed in Claim 1 wherein the neural network is trained entirely on-line based on the output signal.

5. (New) A computer system as claimed in Claim 1 wherein the linear controller comprises a plurality of attitude controllers and the neural network comprises a plurality of neural network subunits, the attitude controllers and neural network subunits controlling generating respective degrees of freedom of the modified control signal.

6. (New) A computer system as claimed in Claim 1 further comprising:

a command transformation unit connected to receive a body angular rate signal, and generating the command signal based on the body angular rate signal.

7. (New) A computer system as claimed in Claim 6 wherein the command signal includes the first derivatives of commanded roll, pitch, and yaw attitudes of an aircraft.

8. (New) A computer system as claimed in Claim 7 further comprising:

an integrator connected to receive the first derivatives of the commanded roll, pitch, and yaw attitude signals, and integrating the first derivatives of the commanded roll, pitch, and yaw attitude signals to generate the commanded roll, pitch, and yaw signals, the integrator connected to supply the commanded roll, pitch, and yaw signals to the linear controller as a part of the command signal.

9. (New) A computer system as claimed in Claim 6 further comprising:

a command augmentation unit connected to receive roll rate and acceleration command signals from a pilot, the command augmentation unit generating the body angular rate signal based on the roll rate and acceleration command signals from the pilot.

10. (New) A computer system as claimed in Claim 9 wherein the command augmentation unit further generates the body angular rate signal based on side slip in addition to the roll rate and acceleration command signals from the pilot.

11. (New) A computer system as claimed in Claim 1 further comprising:

an inverse function unit connected to receive modified control signal, the inverse function unit generating a control signal for controlling the nonlinear physical process based on the modified control signal.

12. (New) A computer system as claimed in Claim 1 further comprising:

an inertial measurement unit (IMU) connected to sense the output of the nonlinear physical process, the IMU generating the output signal based on the output of the nonlinear physical process.

13. (New) A computer system as claimed in Claim 1 wherein the nonlinear physical process relates to flight control of an aircraft.

14. (New) A computer system comprising:

a proportional-derivative (PD) linear controller connected to receive a command signal for a degree of freedom of a controlled physical process, and a measured output signal for the degree of freedom of the output of the controlled physical process, and generating a linear control signal based on the command signal and the measured output signal;

a filter connected to receive the command signal for the degree of freedom, and generating a derivative of the command signal to generate a differentiated command signal;

a node connected to receive the linear control signal from the PD linear controller and the differentiated command signal from the filter, the node generating a pseudo control signal based on the linear control signal and the differentiated command signal; and

a neural network connected to receive the command signal, the measured output signal, and the pseudo control signal from the node, the neural network generating a modified pseudo-control signal based on the command signal, measured output signal, and the pseudo control signal, the neural network connected to supply the modified pseudo control signal to the node for use in controlling the nonlinear physical process to augment the linear control provided by the linear controller to account for the nonlinear nature of the physical process.

15. (New) A computer system as claimed in claim 14 further comprising:

an inversion function unit coupled to receive the command signal, the measured output signal, and the pseudo control signal from the node, the inversion function unit generating a control signal for controlling the nonlinear physical process based on the command signal, the measured output signal, and the pseudo control signal.

16. (New) A method comprising the steps of:

receiving a pseudo control signal and state vectors of a nonlinear physical process at an on-line neural network;

determining a fixed point solution for the output of the neural network based on the state vectors;

adjusting the weights of the neural network based on the state vectors;

modifying the pseudo control signal with the output of the neural network to generate a modified pseudo control signal; and

controlling the nonlinear physical process based on the modified pseudo control signal.

17. (New) A method as claimed in Claim 16 further comprising the steps of:

receiving feedback state and command signals at an attitude controller;

calculating a pseudo control signal based on the feedback state and command signals.

18. (New) A method as claimed in Claim 16 further comprising the steps of:

receiving the modified pseudo control signal at an inverse function unit;

calculating a control signal at the inverse function unit based on the control signal.

19. (New) A method as claimed in Claim 16 further comprising the steps of:

receiving the control signal at an actuator ; and

producing adjustments to at least one controlled device using the actuator based on the control signal.